Using mechanobiology and materials methods in epithelial-mesenchymal transition research

Susan E Leggett

Alex Hruska

Ming Guo

Ian Y Wong

Video Byte

Keywords: Cell Communication and Signaling, actin, vimentin, cytoskeleton, collective migration, extracellular matrix, methods, mechanobiology, epithelial-mesenchymal transition, EMT, assays, review

Posted Date: March 11th, 2021

DOI: <https://doi.org/10.21203/rs.3.rs-318780/v1>

License: This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

Abstract

Cancer-related mortality, a leading cause of death in the US, is driven by tumor invasion and metastasis. Implicated in these processes is epithelial-to-mesenchymal transition, or EMT. EMT drives invasion through a dramatic reorganization of a cell's cytoskeleton and the extracellular matrix. Because EMT is a rare event, undergone by a few abnormal cells, it is difficult to view directly in a patient. But new research methods are providing a lens into this critical process. Culturing cells on planar surfaces is revealing how their EMT behavior is coordinated and driven by leader cells. Research on the protein vimentin highlights its role in enabling cells to contort during migration or proliferation. Other studies examine how topographically patterning culture surfaces changes the behaviors of cells as they slip into and out of EMT. And 3D matrices are being used to examine the dissemination and disorganization of multicellular clusters. Overall, these new technologies allow for fine-tuned control of physical microenvironments and high-resolution spatiotemporal measurement of EMT. In future studies, researchers could apply these methods to drug response trials as an alternative to xenograft models and watch otherwise rare cellular events in EMT and tumor metastasis unfold.